

Appendix D

International Society of Arboriculture Tree Pruning Specifications

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TREE PRUNING SPECIFICATIONS

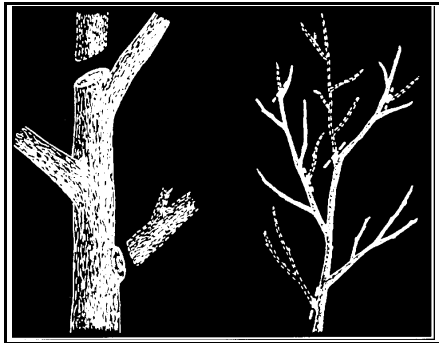
Purpose

The primary goal of pruning is to develop, preserve and enhance the beauty, structural integrity, and functional value of the plant. Pruning should be regarded as a means to compliment the natural form. In fact, topiary (define) pruning can create health hazards for the plant, lower it's value (for trees this can mean thousands of dollars), and waste both time and money.

The following pruning guidelines have been established by the International Society of Arboriculture in an effort to promote practices that encourage the development and preservation of plant structure and health. The guidelines are a working tool, recognizing that trees and shrubs are individually unique in form and structure, and that their pruning needs may not always fit strict rules.

Types of Pruning Cuts

A plant's responses to most techniques of pruning are universal in almost all situations. An understanding of the responses to pruning cuts leads to a more reasoned approach to pruning. There are two main types of pruning cuts — thinning and heading.



A *thinning* cut removes a branch at its point of origin or shortens a branch or leader by cutting it back to a lateral large enough to assume the terminal role (in mature trees this is called "drop-crotching"). Thinning makes the tree or shrub's foliage less dense, reduces weight on heavy limbs, can reduce a tree's height, distributes ensuing invigoration throughout a plant and helps retain a natural shape. Thinning cuts are usually the preferred method of pruning.

Heading is cutting a growing or young shoot back to a bud, or cutting an older branch or stem back to a stub or lateral branch not sufficiently large enough to assume the terminal role. Heading

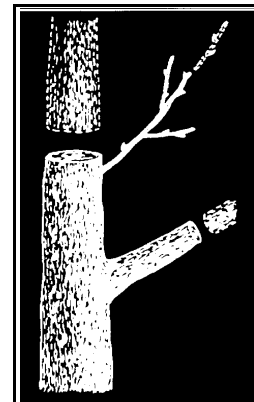
cuts are appropriate for specific purposes such as:

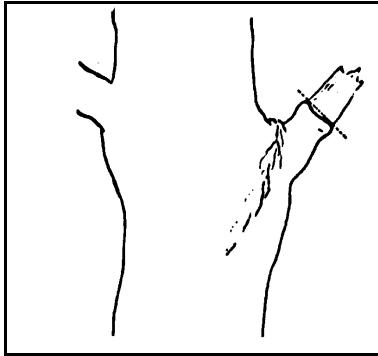
- Reducing leaf area on an unbranched shoot when training young trees.
- Shaping terminal flowering plants (lilac, privet, crape myrtle, roses).
- Shearing hedges for a topiary
- Pollarding trees to develop a geometric, formal look.

Heading should rarely be used in mature trees, since it forces the growth of vigorous, weakly attached upright sprouts originating just below such cuts. The tree's natural form is irreversibly altered. In some situations, branch stubs die back or produce sprouts with low vigor.

Justifications for Pruning

Pruning is a technique that can reduce or eliminate imperfections. Before pruning, determine what imperfections are being corrected. The following are valid reasons to prune.





- Remove *dead, diseased or broken branches* by cutting just beyond the outer edge of the collar of live wood, outside the callus tissue that has begun to form. Only the dead stub should be removed; the live collar should remain intact.
- Remove *crossing lateral branches* (or those that will cross) back to their point of origin. Limbs that rub against each other create wounds and an invitation for disease. They can also break during high winds. Eliminate these branches when young, before contact develops.
- Remove *sharp-angled, vertically growing branches* that have an attachment angle of less than 30 degrees. These branches are not as strongly attached and as they grow in diameter, they are more

likely to have included bark and break. The narrow crotch also collects debris and thus increases the chance of decay and disease. Removing these branches when young will direct growth toward stronger, more securely attached limbs. If such a branch needs to be retained for the sake of form and symmetry, restrict its growth and its end weight.

- Remove or redirect *branches that obstruct* pedestrian or vehicular traffic, lights, signs, solar panels, and other objects.
- Remove *branches that are a fire or pest hazard*. Trees that overhang chimneys should be trimmed back to keep leaves and branches from creating a fire hazard. Some branches that overhang buildings and provide access to the roof or building for rats, racoons, or possums may need to be removed.
- Reduce *heavy, dense foliage in areas of high winds* by thinning selected branches from the inside. This will open up the tree, allowing wind to pass through.
- Remove *branches that detract from the tree's desired appearance*. Pruning should develop the basic framework that will be built upon as the tree matures. Parallel branches within a foot of each other, crossing branches, unbalanced growth, co-dominant leaders, etc. may detract from the desired form and should be eliminated. This kind of pruning is generally done only on young trees.
- Prune *to stimulate regrowth just below the cut*. Heading (or internodal) cuts are useful on young trees to direct growth in a desired direction. It should only be used on branches less than a ½ inch diameter. If used on larger branches, weak, upright water-sprout growth will develop.

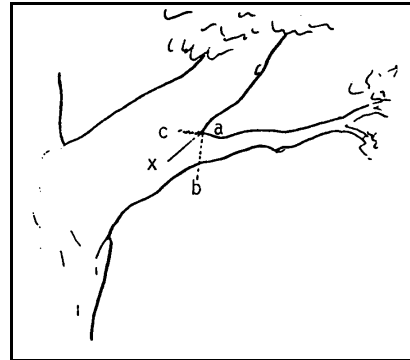
Unnecessary or improper pruning is a waste of money and can be very harmful. Generally, do not prune for the following reasons.

- *To restrict root growth*. A reduction in canopy doesn't reduce or restrict the spread of roots.
- *To reduce the height or maintain it at some arbitrary point*. Plant instead the proper tree or shrub for the spatial confinements of the area. Occasionally, a very large and healthy tree will need pruning to mitigate potential wind damage and subsequent failure. An old healthy tree with a good root system is actually less likely to blow over than a small tree with its smaller, less developed root system.
- *To stimulate new growth on branches over ½ inch diameter*. The sprouts (suckers) that result from these cuts are not as structurally sound as natural occurring branches. They are also more susceptible to disease and insects.

Making the Cut

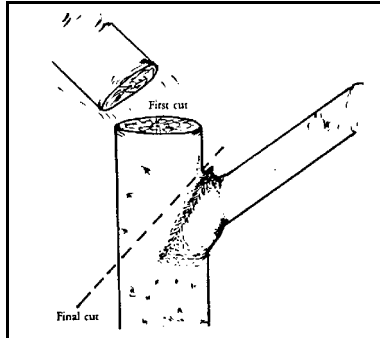
For *thinning cuts on lateral branches*, remove back to the branch collar — do not leave stubs; stubs are entries for rot-causing fungi. Pruning cuts should be clean and smooth, leaving the bark at the edge of the cut firmly attached to the wood.

A three-cut process will reduce chances of injury when removing medium to large-sized limbs. First cut on the bottom of the limb about 12 inches from the branch attachment. Make a second cut on the top about 1 inch from the under cut. The final cut is just outside the branch bark ridge and the outer portion of the collar. The bark ridge runs from the crotch into the trunk (or limb). The collar is the enlarged area at the attachment point. It is a natural defense area and should never be removed. Cutting inside the branch bark ridge and collar (a “flush cut”) should be avoided because it results in a larger wound and exposes trunk tissues to the possibility of decay.



If no collar is visible, the angle of the final cut to the trunk line (angle BAX) should approximate the angle of the branch bark ridge to the trunk line (angle CAX).

Shorten an upright branch/leader by cutting it back to a lateral that is no less than $\frac{1}{3}$ (one third) the diameter of the branch being removed, and has sufficient foliage. This lateral will become the new leader. Stub cut the terminal 5 to 10 inches before the lateral. The final cut should be made just outside and beyond the lateral's branch bark ridge. Do not remove or cut into the branch bark ridge. This type of cut is commonly called “drop-crotching”.

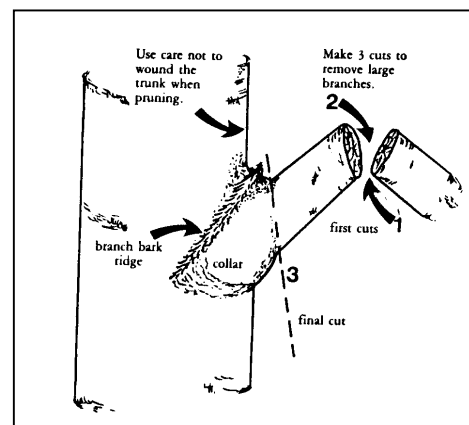


All cuts should be made with sharp and disinfected tools. Large or heavy branches that cannot be safely thrown clear, should be lowered on ropes to prevent injury to the tree or other property.

Do not paint the cuts. Wound dressings and tree paints have not been shown to be effective in preventing or reducing decay, and they may actually interfere with the natural healing process. Therefore, unless specified for disease, borer, mistletoe or sprout control, wound dressings are not recommended for routine use on pruning cuts. A ring of living tissue will form around a correct cut after one growing season.

Size and Quantity of Pruning Cuts

Pruning can be done to different levels of detail or refinement. The removal of many small branches rather than a few large branches requires more time, but produces a less-pruned appearance, forces fewer watersprouts, and helps to maintain the vitality and structure of the tree.



As a rule, not more than 15% of the total foliage should be removed at any one time. Exceptions are: (1) thinning of crowns to prevent toppling by winds following a major root disturbance, and (2) thinning heavy crowns of brittle trees. Removing too much of the canopy upsets the crown-to-root ratio and seriously affects the tree's food supply. A 20-year old tree has developed 20 years worth of leaf surface area. This leaf surface is needed to manufacture sufficient food to feed and support 20 years worth of branches, roots and trunks. Severe pruning cuts off a major portion of the tree's food-making potential and depletes the tree's stored reserves. It is an open invitation for slow starvation.

Also, removing a major portion of the tree's canopy suddenly exposes the bark to the sun's direct rays, often scalding the newly exposed outer bark. Sun burn areas are an open wound to disease and decay. Trees will produce water sprouts in reaction to the new light intensity in an effort to protect itself from scalding. This growth will often create more work during the next pruning cycle.

Training Young Trees

If a tree is pruned correctly when young, it will need fewer and less drastic cuts as it matures. Pruning should promote the basic framework of the tree that will be built upon as the tree matures. Generally, young trees should be pruned to develop into a trees that have a sturdy, tapered trunk with well-spaced branches that are smaller in diameter than the trunk. Properly trained trees will develop into structurally strong trees well suited to the site and their intended landscape function. These trees will fulfill their intended function sooner and should require little corrective pruning as they mature.

These guidelines apply primarily to decurrent (round-headed) large-growing trees, like Oak, Jacaranda and Carob. Trees of excurrent (central leader) growth habit, like most Pines and Eucalyptus, usually need little or no training except to remove laterals that are too low or to control laterals that may compete with the leader.

Trunk Development

For most trees, maintain a single, straight trunk or central leader. Do not head the leader except:

- to correctly position the lowest main branch;
- to space other main branches at least 18 inches apart vertically;
- to remove a tight grouping of terminal twigs so that a more vigorous shoot will develop as the leader.

At least one half of the foliage should be on branches (temporary and permanent) arising in the lower two-thirds of a tree. Similarly, branches should have a like distribution of foliage along their lengths. This will increase trunk taper and more uniformly distribute branch weight and wind stress along the trunk.

Permanent Branch Selection

The height of the lowest permanent branch will depend on the function of the tree and local ordinance; e.g. screen an unsightly view, provide a wind break, shade a patio or be a street tree. Unless they are too close together or weakly attached, remove few or no branches on a newly-planted tree. This will ensure a better selection for permanent main branches in subsequent years, promote trunk taper and early rapid growth of a tree.

Potential permanent branches can be spaced 6 to 12 inches apart by thinning. By the fifth year, these branches should be thinned to at least 18 inches apart, if at maturity the trunk diameter is expected to be greater than 18 inches. Spacing can be less if the expected trunk diameter at maturity is less than 12 inches.

Select permanent branches to maintain an even radial distribution. Where branches are growing one directly above another, maintain at least 15-36 inches above the lower branch on small to medium-size trees, and 60 inches on large-growing trees.

On large-growing trees, except for whorl-branching conifers, branches that are more than one-third the diameter of the trunk should be spaced along the trunk at least 18 inches (50 cm) apart, on center. If this is not possible, because of the present size of the tree, such branches should have their foliage thinned, particularly near their terminals.

Temporary Branches

Retain small branches along the trunk for 1 to 5 years to increase lower-trunk size and taper and to protect the trunk from injury by the sun and vandals. It is more important to have temporary branches below the lowest permanent branch than above.

Preferred vertical spacing of temporary branches is 4 to 6 inches, none should be within 6 inches of potential main branches. Select the least vigorous shoots for temporary branches. If larger-than-desired branches need to be kept as temporaries, head them back to 2 or 3 buds. It is important to have some on the side of the trunk facing the afternoon sun. Attachment angle of temporary branches is not important since they will be eventually removed.

Temporary branches should be kept short to provide clearance for paths, etc. and to increase height growth of the leader. These branches may need more than one pruning during a growing season, depending on tree vigor.

During the first dormant season, prune to thin the temporary branches. Leave about $\frac{3}{4}$ (three fourths) of the temporary branches remaining. They should be uniformly spaced. Remove the largest or cut them back to 2 or 3 buds.

During the next dormant season, reduce the number of temporary branches by $\frac{1}{5}$ (one fifth) to $\frac{1}{4}$ (one fourth) of those present the first year. In most situations, by the fifth dormant season, all of the temporary branches should be removed.

Developing Strong-Branch Structure

As trees grow to maturity, pruning should focus on maintaining or improving structure, and directing the tree's growth.

The relative size of a branch in relation to the trunk is more important for strength of branch attachment than is the angle of attachment. Branches should be $\frac{1}{2}$ (one half) or less the diameter of the trunk immediately above the branch. Permanent branch attachments should not have included bark.

Retain lateral branches along the permanent limbs, but each should be less than $\frac{1}{2}$ (one half) the diameter of the main limb and at least 2 feet (60 cm) out from the trunk. If a scaffold branch is too large in relation to the leader or another scaffold, remove some of the competing scaffold's laterals, particularly near the end. Thin the leader and smaller scaffolds less, if at all. Thinning laterals from a branch will reduce the weight of the branch, slow its total growth and develop a stronger branch attachment. If pruning the competing scaffold is not appropriate, it should be removed.

Maintenance Pruning of Mature Trees

As trees mature, their need for structural pruning should decrease. Pruning should then focus on maintaining tree structure, form, health and appearance by:

- removing dead branches
- thinning to reduce weight and/or the windsail effect of large laterals, and
- maintaining inner branches.

Pruning for crown reduction or shaping is sometimes necessary if branches begin to interfere with surrounding improvements, such as buildings, utility wires or paths. The types of pruning generally used in the industry are described below.

Crown Cleaning

Crown cleaning, or cleaning-out, is the removal of dead, dying, diseased, crowded, weakly attached, low-vigor branches, and watersprouts from a tree's crown.

Crown Thinning

Crown thinning is the selective removal of branches to increase light penetration and air movement through the crown. Thinning opens the foliage of a tree, reduces weight on heavy limbs, distributes ensuing invigoration throughout a tree and helps retain the tree's natural shape. Thinning cuts are usually the preferred method of tree pruning. Seldom should more than $\frac{1}{4}$ (one fourth) of the live foliage be removed.

At least $\frac{1}{2}$ (one half) of the foliage remaining should be on branches arising in the lower (two thirds) of the tree. Likewise, when thinning laterals from a limb, an effort should be made to retain well-spaced inner lateral branches with foliage. This will distribute more evenly stress (resulting from pruning) along a branch and throughout the tree.

Caution must be taken not to "lion-tail," removing all or most of the inner foliage. This places foliar weight at the ends of the branches and may result in sunburn, watersprouts, weakened branch structure and limb breakage.

Crown Raising

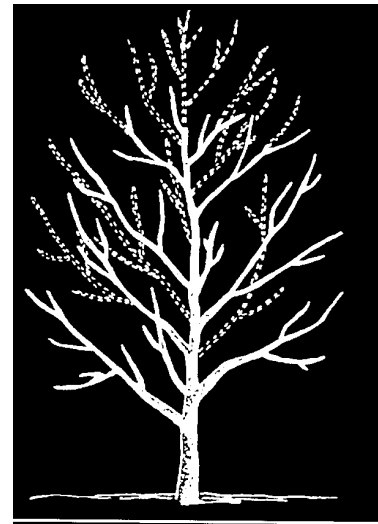
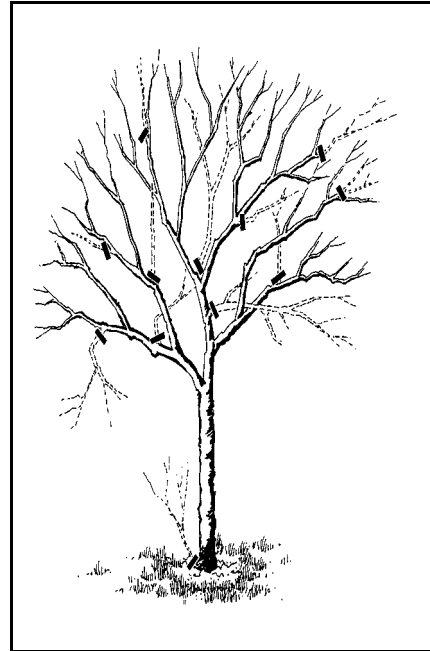
Although it is important to have at least half of the foliage on branches originating in the lower $\frac{2}{3}$ of the tree and an even distribution of foliage along the length of the branches, in some cases, this may not be possible. Local ordinances sometimes require removal of low branches to provide clearance for buildings, vehicles, pedestrians and views.

When pruning for view, it is preferable to develop spaces between branches, or "windows" through the foliage of the tree, rather than to severely raise or reduce the crown.

Crown Reduction

If a tree has grown too large for its allotted space, either:

- Remove the tree, particularly if it has an excurrent, central-leader growth habit, and plant a more appropriate species;
- Thin branches to reduce tree height and/or spread by pruning back leaders to lateral branches (particularly useful for decurrent, round-headed tree);
- Head branches to reduce the height and/or spread of the tree crown. This is the least desirable of the three alternatives as it produces weakly attached water-sprout growth. See discussion



on topping.

Thinning (rather than heading) cuts to reduce the size of the crown is less injurious to the tree. It results in fewer sprouts and can maintain the structural integrity and natural form of the tree, delaying the need to re-prune. This is the preferred method of crown reduction.

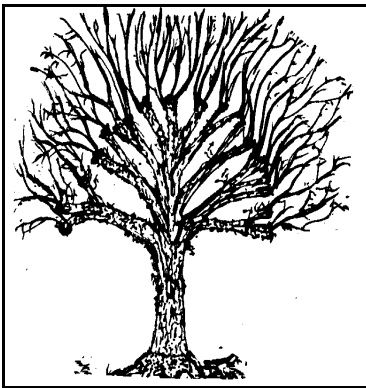
Remove selected smaller branches back to the main branch to reduce the tree's height and spread while retaining its natural shape. Cuts are made only on small branches and close to the trunk, leaving only the collar of the removed branch instead of stubs. These cuts heal more rapidly and completely.

Occasionally on vigorous small diameter trees with broken or damaged tops, the crown can be reduced in height and/or spread by heading cuts that leave a stub containing buds or a lateral branch that is not large enough to assume the terminal role. If such a cut is made, it is preferable to cut at an angle with the high side towards the afternoon sun. Heading cuts, however, should seldom be used for crown reduction on large trees because vigorous, weakly attached, upright sprouts are forced just below such cuts, the tree's natural form is altered and the heading cuts are more subject to decay.

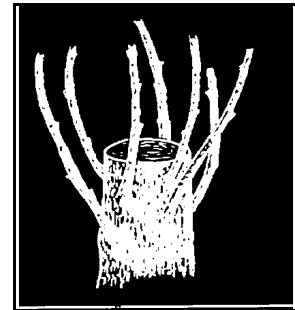
Topping

Topping (or "pollarding") is the drastic removal or cutting back of large branches using heading cuts. The tree is pruned like a hedge or rose bush; main branches are cut to stubs. Topping injures trees severely and thus, is not typically an acceptable practice. In limited circumstances however, it may be unavoidable and approved for a specific design appearance by the landscape architect.

- Topping stimulates the regrowth of structurally unsound, dense upright branches. These water sprouts are weakly attached and more susceptible to disease and insects.
- Since watersprout regrowth is generally rapid, a topped tree will grow back to its original height faster and denser than a properly thinned tree.



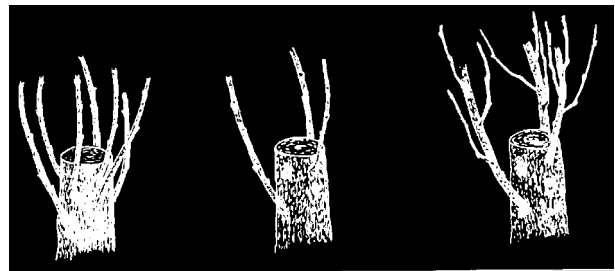
- Topping permanently disfigures the tree. The stubs, broom-like sprout growth, and pruning cuts are unsightly and mutilate its natural beauty.
- Topping disturbs the crown-to-root ratio and severely depletes the tree's food-making potential. It is an open invitation for slow starvation.
- Large branch stubs seldom close or callus. This leaves the stubs vulnerable to insects and decay.



A properly trimmed tree seldom looks pruned to the untrained eye. *If it is very obvious the tree has just been pruned, it has probably been pruned incorrectly.*

Crown Restoration

Crown restoration is intended to improve the structure and appearance of trees that have sprouted vigorously after being broken, topped or



severely pruned using heading cuts. One to three sprouts, on main branch stubs, should be selected to form a natural appearing crown. The number of sprouts left depends on the size of the branch and number of branches in the tree. To control length growth, ensure adequate attachment, and reduce weight and wind-sail effects that could break sprout attachment, the sprout may need to be cut to a lateral, thinned by removing some laterals on the sprout, or headed. Successful crown restoration may require several prunings over a number of years.

Tree Climbing Techniques

Pre-Climbing Examination

Climbing techniques can affect tree health by preventing, or creating, injuries to the tree. Special care should be taken by the climber to ensure that the tree is safe to climb before entering it. This inspection should also include an examination of the tree's root collar (where the roots flare out into the soil).

The tree should be inspected for potential hazards such as branch attachments with included bark, co-dominant (equal-sized) stems, trunk and branch about equal size, main watersprout growth, limbs with cracks, broken limbs and hangers. Discussion should take place with the crew as to how to avoid or reduce the hazards to the climber when such structural defects are present in the tree.

Hazards of the work site should also be reviewed, such as the presence and location of all electrical conductors, especially high voltage conductors. Check for property that might be damaged by falling branches.

If no root flare is present, either the soil may have been raised over the original grade, girdling roots may be present or the tree is of a species that seldom develops root flares. In the first two cases, a potentially dangerous situation may exist, and a root-collar excavation is recommended. Likewise, if there are signs of significant injury or decay at the base of the trunk, an excavation of the root collar is recommended.

A root-collar excavation includes the removal of soil around the trunk, six to twelve inches below the original grade, to expose the major roots for inspection. These roots are then examined for signs of healthy or dead bark and/or decay.

After the examination is complete, the soil should be returned to the original grade of the tree's root collar — the height of which can be determined by horizontal lines or wrinkles on the lower trunk or major buttress roots. Tree wells resulting from deep soil fills that have been removed during the root collar excavation can be covered with grates, decks or surrounded by small fences to maintain public safety.

Any diseased tissue found on the roots should be left exposed for one or more years, or until callus is well formed and the progress of the disease has stopped. In areas that experience freezing winter temperatures, roots should be protected by covering them with mulch or soil, and exposing them again the next spring.

Climbing Practices

Except for the actual pruning cuts, climbing and pruning practices should not injure the tree. Climbing spurs, gaffs, climbing irons or hooks shall not be used except for tree removal or where branches are more than a throw-line distance apart or for emergency rescue. In such cases the spurs should be removed once the climber is tied in.

Heavy limbs should be lowered on ropes to avoid damaging bark on limbs and trunks below. Avoid rope injury to thin-barked trees from loading out heavy limbs by installing a block in the tree

to carry the load. A block or rope guard may also be used to reduce injury to the bark from the climber's line.

Pruning Schedules

As a general rule, trees should be pruned when it is naturally under the least amount of stress, usually *before* the main growing season. Exceptions are to remove hazards, thin after root pruning, or prior to fall Santa Ana wind conditions. Most deciduous trees should be pruned when they are dormant, typically in late fall and winter. Evergreen trees have more leeway, but avoid pruning during the hot summer months (June through September) this would create additional stress and lead to sunburn damage. Trees susceptible to frost-damage should be trimmed immediately after the last chance of frost. Full growth on the tree will protect it during a cold winter.

The pruning cycles recommended below are based on the growth rates of individual tree species and known limitations of urban areas. The pruning season specified may need to be slightly manipulated (± 20 days) due to yearly fluctuations in temperature and in order to schedule work crews efficiently. Pruning during the wrong season could damage the tree and/or prevent adequate growth or flowering.

Conditions may exist that will necessitate more frequent pruning. For example: individual branches may need to be removed to prevent interference with walkways, chimneys, walls, etc., or a tree may need to be trimmed more frequently due to litter impact in high traffic areas or to protect view corridors. Because young plants often have special pruning needs, juvenile pruning is listed separately from mature. Other factors such as age, location, pest/disease control, and design purpose may require alteration of this schedule. The Contractor will inform the Association representative if any tree requires special pruning outside of the normal scheduled maintenance.

The goal of these specifications is to create *natural looking* trees. Unnecessary or improper pruning is a waste of time and money, can seriously injure the tree, and can create faster growth requiring even more frequent pruning.

During and in-between prunings, it is important that all trees be inspected for hazards, broken branches, injury, invasive roots, and diseases and managed accordingly at the direction a certified arborist.